CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The modern day designs of vehicles, especially in the racing industry involve a great deal of air flow study. This study shows that drag force adversely affects the forward motion of the car and that there is a difference in the pressure between the air flowing above and below the car (Chainani, 2008)

The study involves the flow of air against the vehicle roof is one most of the important aspect designing vehicle. However, research on airflow convertible car roofs rarely examined in Malaysia than in European countries and should be implemented. A convertible is a type of automobile in which the roof can retract and fold away having windows which wind-down inside the doors, converting it from an enclosed to an open-air vehicle. Many different automobile body styles are manufactured and marketed in convertible form.

Open cars may have a folding roof but only detachable side screens which snap-on; they do not convert into a fully enclosed car with proper weather-protection. The wind-up windows make the distinction between an open car and an all-weather car now known as a convertible. According to Knight (2009), the designer of convertible vehicles needs to consider the acoustical properties, quality of the interior environment, fatigue life and the aesthetic integrity of the flexible roof. Each of these concerns is affected, to a greater or lesser extent, by the interaction of the flexible roof material and its supporting structure with the aerodynamic loading on the material. For many

convertibles, the roof quickly settles into a deformed shape for which the roof's internal forces are in equilibrium with the aerodynamic loading.

1.2 PROBLEM STATEMENT

The problem regarding this project is to analyze the two dimensional flow of convertible car roof using Computational Fluid dynamic. If we can see, there are various forms of roof design made from different car manufacturers but in Malaysia, there are no Malaysian manufacturer's that produces convertible car roof. This is due to climatic factors as the weather in Malaysia as opposed to weather the country that issued convertible car. Materials and design should be reviewed to allow convertible car model produced in Malaysia. Malaysia only imports so far this model and rarely produces models in Malaysia, but only for export to countries that use this vehicle as European countries. In addition, the design factor can also be affecting the total vehicle drag. Drag will cause many problems on the performance of vehicles like instability, noise and vibration, also fuel consumption. In this project, the use of CFD software is very important because it is more economical compared with experiment.

1.3 OBJECTIVE

The objectives of the project are as follows:

i. To analyze and study the effect of pressure coefficient (C_p) and Drag Coefficient (C_d) on convertible car roof.

1.4 SCOPES OF STUDY

The scopes of the project are as follows:

i. To study the effect towards convertible car roof using CFD method (velocity 120km/h) under steady state condition.
ii. Validate with experiment from other researchers

iii. Study the pressure coefficient and drag coefficient on 4 different designs (international market) of convertible car roof.

iv. Boundary condition will be done in a wind tunnel 1:20 (experiment set up)